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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,548	07/10/2003	Michael John Bowman	134195	4282

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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NISKAYUNA, NY 12309

EXAMINER	
VANOY, TIMOTHY C	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 11/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/617,548	BOWMAN ET AL.	
	Examiner	Art Unit	
	Timothy C. Vanoy	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *2 and 3* is/are allowed.

6)☒ Claim(s) *1 and 4-22* is/are rejected.

7)☒ Claim(s) *4* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/10/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

a) Claim 4 is objected to because it does not appear that the applicants' want to use all of the species of the power plant at the same time. It is suggested to use standard Markush language to set forth the species of the power plant.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 20 is rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent 6,793,910 B1.

U. S. Patent 6,793,910 B1 discloses a process for making a hydrogen-containing gas: please see col. 2 lines 54-56. The hydrogen gas of U. S. Patent 6,793,910 B1 is not any different from the hydrogen gas of applicants' claim 20: please see the discussion of the *In re Thorpe,* 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) court decision set forth in section 2113 in the MPEP (Rev. 3, Aug. 2005).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The person having ordinary skill in the art has the capability of understanding the scientific and engineering principles applicable to the claimed invention. The references of record in this application reasonably reflect this level of skill.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4, 8-11, and 14-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,793,910 B1 to Lyons et al.

Claim 1 in Lyons et al. reports a method and the patent discloses an apparatus for producing synthesis gas (i. e. a hydrogen containing gas: please also see col. 2 lns. 54-56), by:

Introducing steam and hydrocarbon into a rotary-type compression reactor (please also see fig. 1);

Compressing the steam and the hydrocarbon;

Raising the temperature of the steam and hydrocarbon;

Spark-igniting the steam and hydrocarbon to produce a synthesis gas;

Expanding the synthesis gas, and

Exhausting the synthesis gas product out of the compression reactor.

Note that col. 3 line 66 to col. 4 line 2 in the Lyons et al. patent reports that the compression reformer may require the addition of mechanical power, in a manner rendering obvious the limitations of applicants' claim 4.

The difference between the applicants' claims and the Lyons et al. patent is that the applicants' independent claims call for the production of hydrogen without any combustion, whereas the Lyons et al. process conduct the reformation with what appears to be some minimal amount of combustion: please see col. 3 lns. 29-35 in the Lyons et al. patent.

The Lyons et al. patent reports that the amount of oxygen that is fed into the reactor is limited so that oxygen mass balance inhibits the combustion reactions: please see col. 3 lns. 29-35. Also, the chart 1 in col. 3 in the Lyons et al. patent reports that (unwanted) water is a product of the combustion reaction (not the desired hydrogen).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process and apparatus described in the Lyons et al. patent by operating the reforming reactions without combustion, in the manner required in the applicants' independent claims, because col. 3 lines 29-35 in the Lyons et al. patent fairly suggests that the combustion reactions should be inhibited, and in so doing one would convert the hydrogen values into wanted hydrogen gas rather than unwanted water.

Note that as the steam is injected along with the hydrocarbon into the compression chamber (as taught in claim 1 in the Lyons et al. patent), the steam will inherently heat the hydrocarbon gas, in the manner rendering obvious the limitations that auxiliary heat is introduced into the compression chamber set forth in applicants' claims 14, 15 and 17.

The difference between the applicants' claims and the Lyons et al. patent is that the applicants' claims 8, 11, 16, and 21 call for preheating the hydrogen-containing gas (prior to injection into the compression reactor) or introducing auxiliary heat into the compression chamber by using the heat from by-product conversion into exhaust product or from the heat generated from an internal combustion engine, however it is submitted that these differences would have been obvious to one of ordinary skill in the art at the time the invention was made because the Lyons et al. patent expressly teaches that the reformation reaction occur at elevated temperatures (a temperature of 1,073 ^{o}K is mentioned in Example 1 and a temperature of 1,273 ^{o}K is mentioned in Example 2 in the Lyons et al. patent) and pre-heating the feed gas and/or transferring

heat to the compression chamber (in the manner required in applicants' claims 8, 11, 16 and 21) is an obvious means for more quickly attaining the elevated reaction temperatures used in the reformation processes described in the Lyons et al. patent. Note that the rationale to modify a reference does not have to be expressly stated in the prior art; the rationale may be impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art: please see the discussion of the *In re Fine* 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) court decision set forth in section 2144 in the MPEP (Rev. 3, Aug. 2005).

Claims 1 and 4-22 rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,793,910 B1 to Lyons et al. as applied to claims 1, 4, 8-11, and 14-21 above, and further in view of U. S. Patent 6,066,307 to Keskar et al.

Claim 1 in Lyons et al. reports a method and the patent discloses an apparatus for producing synthesis gas (i. e. a hydrogen containing gas: please also see col. 2 lns. 54-56), by:

Introducing steam and hydrocarbon into a rotary-type compression reactor (please also see fig. 1);

Compressing the steam and the hydrocarbon;

Raising the temperature of the steam and hydrocarbon;

Spark-igniting the steam and hydrocarbon to produce a synthesis gas;

Expanding the synthesis gas, and

Exhausting the synthesis gas product out of the compression reactor.

Note that col. 3 line 66 to col. 4 line 2 in the Lyons et al. patent reports that the compression reformer may require the addition of mechanical power, in a manner rendering obvious the limitations of applicants' claim 4.

The difference between the applicants' claims and the Lyons et al. patent is that the applicants' independent claims call for the production of hydrogen without any combustion, whereas the Lyons et al. process conduct the reformation with what appears to be some minimal amount of combustion: please see col. 3 lns. 29-35 in the Lyons et al. patent.

The Lyons et al. patent reports that the amount of oxygen that is feed into the reactor is limited so that oxygen mass balance inhibits the combustion reactions: please see col. 3 lns. 29-35. Also, the chart 1 in col. 3 in the Lyons et al. patent reports that (unwanted) water is a product of the combustion reaction (not the desired hydrogen).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process and apparatus described in the Lyons et al. patent by operating the reforming reactions without combustion, in the manner required in the applicants' independent claims, because col. 3 lines 29-35 in the Lyons et al. patent fairly suggests that the combustion reactions should be inhibited, and in so doing one would convert the hydrogen values into wanted hydrogen gas rather than unwanted water.

Note that as the steam is injected along with the hydrocarbon into the compression chamber (as taught in claim 1 in the Lyons et al. patent), the steam will inherently heat the hydrocarbon gas, in the manner rendering obvious the limitations

that auxiliary heat is introduced into the compression chamber set forth in applicants' claims 14, 15 and 17.

The difference between the applicants' claims and the Lyons et al. patent is that the applicants' claims 8, 11, 16, and 21 call for preheating the hydrogen-containing gas (prior to injection into the compression reactor) or introducing auxiliary heat into the compression chamber by using the heat from by-product conversion into exhaust product or from the heat generated from an internal combustion engine, however it is submitted that these differences would have been obvious to one of ordinary skill in the art at the time the invention was made because the Lyons et al. patent expressly teaches that the reformation reaction occur at elevated temperatures (a temperature of 1,073 °K is mentioned in Example 1 and a temperature of 1,273 °K is mentioned in Example 2 in the Lyons et al. patent) and pre-heating the feed gas and/or transferring heat to the compression chamber (in the manner required in applicants' claims 8, 11, 16 and 21) is an obvious means for more quickly attaining the elevated reaction temperatures used in the reformation processes described in the Lyons et al. patent. Note that the rationale to modify a reference does not have to be expressly stated in the prior art; the rationale may be impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art: please see the discussion of the *In re Fine* 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) court decision set forth in section 2144 in the MPEP (Rev. 3, Aug. 2005).

The difference between the applicants' claims and the Lyons et al. patent is that applicants' claims 5-7, 12, 13 and 22 call for the step of separating the hydrogen-

containing product from the reformation into a hydrogen-rich product and a by-products rich product (for example, by a membrane separator: please see applicants' claim 6).

U. S. Patent 6,066,307 to Keskar et al. describes a process for producing synthesis gas which includes the step of passing the synthesis gas product through a hydrogen transport membrane to produce a hydrogen-rich product and a by-products-rich product: please see the abstract and also col. 4 lines 45-50 in U. S. Patent 6,066,307.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of the Lyons et al. patent by subjecting the product synthesis gas to a hydrogen separation membrane, as disclosed in col. 4 lines 45-50 and the abstract of U. S. Patent 6,066,307 and required in applicants' claims 5-7, 12, 13 and 22, because of the expected advantage of obtaining highly pure hydrogen product – the desired product of the applicants' claims and the Lyons et al. patent: please see col. 1 lines 16-20 in the Lyons et al. patent.

Claims 2 and 3 have not been rejected under either 35USC102 or 35USC103 because there is no teaching or suggestion in U. S. Patent 6,793,910 B1 to modify the compression reactor to include a second entry port for receiving steam in the manner required by applicants' claims 2 and 3.

The following references, which are indicative of the state of the art, are made of record:

U. S. patent 6,767,530 B2 disclosing a method for producing hydrogen in which the heat employed in the process is recovered using a regenerative bed system, and

U. S. Patent 6,589,303 B1 disclosing a hydrogen production process in which the hydrogen is recovered via membrane separation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy C. Vanoy whose telephone number is 571-272-8158. The examiner can normally be reached on Mon-Fri 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Timothy C Vanoy
Timothy C Vanoy
Patent Examiner
Art Unit 1754

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